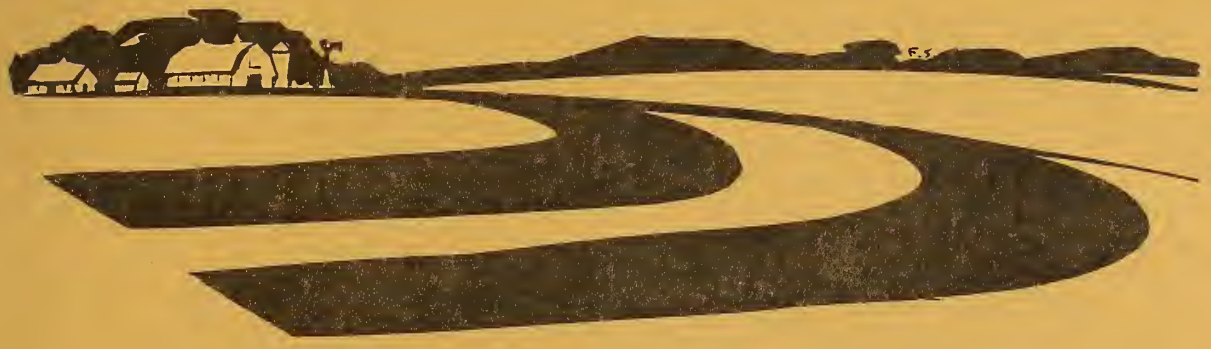
BROADWAY LAKE WATERSHED

MODEL IMPLEMENTATION PROJECT

1982

FINAL REPORT



ANDERSON COUNTY SOUTH CAROLINA

FINAL REPORT
BROADWAY LAKE WATERSHED
MODEL IMPLEMENTATION PROJECT
ANDERSON COUNTY, SOUTH CAROLINA
DECEMBER 31, 1982

I. INTRODUCTION

A. 1. Location and Description: The Broadway Lake Watershed containing approximately 25,183 acres is located in Anderson County, South Carolina. This watershed is located in Major Land Resource Area (MLRA)-136-Southern Piedmont. Estimated current land uses are: Cropland - 6,500 acres; Pasture and Hayland - 8,200 acres; Woodland - 7,000 acres; Other Land - 3,096 acres (residential, roads, recreation, commercial); and Water - 400 acres (includes Broadway Lake - 302 acres). Water quality problems result from erosion, sedimentation and flooding.

2. Purpose: The primary purpose of the Model Implementation Project is to demonstrate the effectiveness in small geographic areas of concentrating and coordinating the various USDA and EPA water quality management programs and to illustrate how the water quality management plans developed under Section 208 of the Federal Water Pollution Control Act Amendments of 1972 can be translated into action.

3. Objectives: The objectives as set forth in the plan are:

a. The effects of applied Best Management Practices in reducing non-point sources of pollution.

b. The rate of application of Best Management Practices through a voluntary program.

c. The effects of a coordinated effort by USDA, EPA, and state and local agencies in improving water quality.

d. The effects of applied Best Management Practices in improving the quality of Broadway Lake Recreational Facility for fishing, swimming and boating.

e. The effectiveness of non-point source technology for monitoring.

f. Procedures and methodologies of identifying specific non-point source problems.

g. Cost-effectiveness of Best Management Practices.

B. Major Contributions of Each Agency:

1. Soil Conservation Service was designated as the lead agency and furnished technical assistance in the planning and application of BMPs.

2. Agricultural Stabilization Conservation Service provided cost-share funds for establishment of BMPs.

3. South Carolina Land Resources Conservation Commission furnished a project coordinator and clerical personnel, public information and a limited amount of technical assistance.

4. Cooperative Extension Service was responsible for public information and education.

5. South Carolina Department of Health and Environmental Control's basic responsibility was the study of the effectiveness of BMPs on the quality of water entering Broadway Lake, the lake itself and downstream water bodies.

6. Clemson University was responsible for the monitoring of water quality and aquatic ecosystems.

7. South Carolina Highway Department furnished labor and equipment for roadside erosion work on state roads in the MIP.

8. South Carolina State Commission of Forestry furnished technical assistance for planning and applying BMPs on woodlands.

9. Anderson County Soil and Water Conservation District was the local coordinating agency for the preparation and implementation of the MIP work plan.

10. ASCS County Committee was responsible for the development of the county cost-share percentage for each practice and their priorities.

II. ANALYSIS OF INSTITUTIONAL ARRANGEMENTS

A. Organization Arrangements:

A local coordinating committee, consisting of heads of participating agencies, organized in the beginning remained intact since its inception. The committee met on a quarterly basis with the project coordinator serving as chairman. Other members are responsible for reporting their agencies' activities, making suggestions to the group and preparing necessary reports.

A local advisory committee consisting of seven landowners from within the watershed was established at the outset and continued to function. The advisory committee represented the people

within the MIP area and advised the local coordinating committee of actions and activities needed. A soil and water conservation district commissioner served as chairman of the advisory committee.

B. Program Operations:

For a program of this magnitude, importance and short duration, it was a necessity that there be complete cooperation of all participating agencies.

The procedures for the programs did not change at any point and followed the same pattern as the regular ACP program. Different sign-up dates from regular ACP on cost-sharing were used each year as well as cost-sharing percentages on most BMPs. Pooling arrangements have only been used on two occasions since this area is not conducive to this type arrangement.

A concerted information effort was initiated at the outset and was maintained. Requests for planning application assistance were given top priority in the county.

Possibly the biggest change in the program's direction or priority was the added emphasis placed on conservation tillage. This approach required considerable selling and results have only been really noticeable in the past three years. A Young Adult Conservation Corps program was used effectively at the outset of the project to help with roadbank stabilization work.

An advisory committee of citizens living within the community was established to insure public involement and participation in the deliberations and decisions affecting the people within the area.

C. Successes and Problems Encountered:

From the outset there were no problems on the type of organizational arrangements desired.

Generally, project priorities originally established have been successful. In the beginning, planning and application priorities were not set for the sub-watershed to be monitored. The failure to do so resulted in slower application rates of BMPs needed in these areas to best evaluate their effects within the time allocated for monitoring.

Public involvement, through the advisory committee, was very successful. Limited opportunity existed in this watershed for public involvement through existing organized groups. Newspaper articles, radio and TV programs, and a MIP newsletter were used to acquaint the people with the purpose and intent of the project. However, one-on-one contact was necessary to secure substantial public involvement and participation.

Interagency cooperation and coordination has been very good throughout the program except in a couple of instances.

All agencies readily agreed to their assignments and for the most part committed their resources to the success of the program.

The MIP was approved for an EPA Section 314 Grant for the restoration of Broadway Lake, located at the mouth of the watershed. Section 314 funds were approved for the construction of debris basins and roadbank stabilization. The grant was later amended to provide one-half the cost of repairs to the emergency spillway. EPA required that funds for the debris basins could not be used until all repairs to the dam were completed. Repairs to the dam involved three phases with Phase III being the repair to the emergency spillway. Anderson County provided funds for Phase I, $10,000 for repairs to the dam. The local state legislative delegation and the South Carolina Land Resources Conservation Commission secured state funds for Phase II, $151,000 for repair of the principal spillway. To date, the local people have been unable to secure the local 50 percent cost ($350,000) of repairing the emergency spillway. Therefore, the debris basins, a major BMP, have not been installed.

III. PROGRAM ACCOMPLISHMENTS

A. Best Management Practices Applied - Prior Three Years:

BMPs	Participating Farms 1975 - 1977 Avg/Yr	Units	Accomplishments 75-77			Cost/ Unit	Total Cost	Cost Share	Farmers Cost
			Non Cost Share	Cost Shared	Total				
Name	No.	-	Amt.	Amt.	Amt.	$	$	$	$
Cover Crops									
Cons. Tillage	1	Ac.	144	0	144	25	3,600	0	3,600
Strip Cropping									
Field Borders									
Grassed Waterways	.3	Ac.	0	.5	.5	375	188	100	88
Terraces									
Diversions									
Ag. Waste Mgt. Sys.	.6	No.	2		2	5,000	10,000	0	10,000
Past. & Hay Plant.	2	Ac.	25	100	125	75	9,375	4,000	5,375
Past. & Hay Mgt.	10	Ac.	300	1,500	1,800	30	54,000	32,500	21,500
Farm Ponds									
Tree Planting									
Timber Std. Imp.	2	Ac.	423		423	30	12,690	0	12,690
Wildlife Hab. Dev.									
Critical Area Trt.	.3	Ac.	1.0		1.0	475	475	0	475
Grass									
Trees									
Gullies									
Roadbanks									
Debris Basins									
Cons. Plans									
TOTALS							90,328	36,600	53,728

B. Best Management Practices Applied - During Project Period:

BMPs	Units	Accomplishments 78-82			Cost/ Unit	Total Cost	Cost Share	Farmers Cost	Goals	Percent of Goals Accomp.
		Non Cost Share	Cost Shared	Total						
Name	-	Amt.	Amt.	Amt.	$	$	$	$	-	%
Cover Crops	Ac.	141	0	141	32	4,512	0	4,512	750	19
Cons. Tillage	Ac.	807	715	1,522	35	53,270	21,450	31,820	600	253
Strip Cropping	Ac.	35	288	323	60	19,380	4,200	15,180	500	65
Field Borders	Ft.	2,000	112,300	114,300	.12	13,716	8,984	4,732	100,000	114
Grassed Waterways	Ac.	1	35	36	560	20,160	12,237	7,923	55	65
Terraces	Mi.	1	47	48	422	19,960	16,769	3,191	100	47
Diversions	Ft.	0	1,050	1,050	.40	420	381	39	5,000	21
Ag. Waste Mgt. Sys.	No.	1	1	2	8,000	16,000	8,000	8,000	4	50
Past. & Hay Plant.	Ac.	279	521	800	121	96,800	19,277	77,523	1,000	80
Past. & Hay Mgt.	Ac.	0	4,883	4,883	50	244,150	144,067	130,083	3,000	163
Farm Ponds	No.	0	63	63	3,957	249,291	153,720	95,571	30	210
Tree Planting	Ac.	0	258	258	125	32,250	18,942	13,308	200	129
Timber Std. Imp.	Ac	1,023	0	1,023	50	51,150	0	51,150	1,000	102
Wildlife Hab. Dev.	Ac	181	0	181	3	543	0	543	200	91
Critical Area Trt.										
Grass	Ac.	0	206	206	620	127,720	50,470	77,250	43	479
Trees	Ac.	1	5	6	100	600	250	350	10	60
Gullies	Ac.	0	6	6	720	4,320	3,200	1,120	10	60
Roadbanks	Ac.	0	33	33	2,678	88,374	35,000*	53,374**	38	87
Debris Basins	No.	0	7	7	4,000	28,000	20,456	7,544	19	37
Cons. Plans	No.			110					200	55
Woodland Plans	No.			55					100	55
TOTALS						1,070,616	487,403	583,212		

*Section 314 EPA Funds

**Includes vegetation and sloping of roadbanks by South Carolina Highway Department

C. Technical Assistance:

Soil Conservation Service assigned one additional soil conservationist to the MIP during fiscal years 1978-1980. Other SCS staff members spent a greater proportion of their time than usual on conservation planning and servicing ACP referrals.

The State Commission of Forestry's input for technical assistance was limited to the assistance of one project forester who also had the remainder of the county.

The project coordinator also assisted in the technical operation during periods when the schedule was tight and whenever he was needed. South Carolina Land Resources Conservation Commission provided the district office with a technician during the first 18 months of the program. For the latter half of the program, his role was dual purpose as he worked with other districts as a field representative. (See Section III-F for summary of technical assistance.)

Agencies furnishing technical assistance, Soil Conservation Service, State Commission of Forestry, SC Land Resources Conservation Commission, gave priority to servicing in the MIP.

The need to service a large number of referrals in a relatively short application period required diverting persons from other activities outside the project area. Unusual weather conditions created problems in establishing vegetative practices. These weather conditions were heavy erosive rains and severe extended drought. Rate of application increased at a significant rate during the last three years of the project.

D. Information and Education:

During the project period, an accelerated effort was put forth to acquaint the landowners in and out of the project area with the purpose and results of the project. Activities involved:

News releases - Cooperative Extention Service, Soil Conservation Service, SC Land Resources Conservation Commission, Department of Health and Environmental Control, State Commission of Forestry.

Feature articles - Local newspapers - staff writers.

Radio programs - Cooperative Extension Service, Soil Conservation Service, SC Land Resources Conservation Commission.

TV programs - Soil Conservation Service, Agricultural Stabilization Conservation Service, SC Land Resources Conservation Commission.

Newsletters - SC Land Resources Conservation Commission, MIP Newsletter, Soil Conservation District, ASCS.

Tours - All agencies, average three per year. Involved local, state, national and international groups.

Major changes over previous methods were primarily in the variety and frequency of activities. The instigation of a MIP newsletter, primarily to the landowners within the area, provided a direct method of keeping each of them informed of needs, opportunities for assistance, and results of their efforts.

This effort helped to point out the need and results when each agency involved put some of their time and energy into information and education.

E. Changes in Public Participation:

As stated in Section II.C., the effects of the local advisory committee was of tremendous value in public participation. Their being within the project area and communicating with other landowners enlightened them on the purpose of the project and benefits to the operator or landowner.

The publication of a monthly newsletter was initiated in September 1979 and was mailed to 359 people, the majority of which are operators and landowners within the project. Contents in the newsletter generally depicted what landowners were doing on their own lands in the establishment of best management practices.

During the program there have been no new public or interest group that has become involved.

Since there were no public organizations in the project area, the role of agencies in this regard has not changed. A one-on-one contact seemed to bring in more participants and has been used throughout.

In addition to one-on-one contact, the newsletter served as a motivation tool and made it much easier to talk with individuals.

F. Total Program Inputs by Agencies and Landowners:

Agencies	Technical Assistance	Cost Sharing and Other Financial Assistance	Management, Administration and Coordination	Information and Education	Monitoring and Evaluation	Clerical	Total Man/ Days	Total Funds
ASCS								
M/dy			104			627	731	
Funds		503,008	5,383			32,914		541,305
CES								
M/dy				7			7	
Funds				525				525
DHEC								
M/dy					315		315	
Funds					45,387			45,387
Clemson University								
M/dy					2,633		2,633	
Funds					146,600			146,400
SCD								
M/dy			35	12			47	
Funds			2,800	960				3,760
LRCC								
M/dy	420		767	75		203	1,465	
Funds	28,467		56,901	5,410		12,823		103,601
SCS								
M/dy	898		166	52	79		1,195	
Funds	78,000		14,923	4,675	7,102			104,700
SFC								
M/dy	173		20			63	256	
Funds	20,800		2,490			2,830		26,120
SCHD								
M/dy	30	1,203					1,233	
Funds	2,400	50,186						52,586
YACC								
M/dy		87					87	
Funds		22,010						22,010
EPA								
M/dy								
Funds		30,420		1,700				32,120
Farmer								
M/dy		2,100					2,100	
Funds		132,300						132,300
TOTALS								
M/dy	1,521	3,390	1,092	146	3,027	893	10,069	
Funds	129,667	737,924	82,497	13,270	198,889	48,567		1,210,814

IV. WATER QUALITY IMPROVEMENT

A. Impaired Water Use:

Broadway Lake was built in the 1930's and developed into a recreational facility for Anderson County. It is a 302 acre body of water at the mouth of a 25,000 acre watershed. In past years, soil erosion from farmland, roadside banks and various construction sites has impaired the lake's recreational use by inundation of approximately 80 acres with sediment.

In addition to the lake itself, stream channels have filled with sediment creating swampy areas that have affected fish and other wildlife.

B. Significant Pollutants:

As mentioned above, the most significant pollutant in the watershed has been sediment. Using information from similar watersheds, it was estimated that the gross erosion in this watershed to be 48,000 tons per year reaching Broadway Lake. Seventy percent of this was coming from cropland and eighteen percent from critically eroding areas and roadbanks. From monitoring information that is available, there appears to be significant amounts of nutrients, primarily N and P, transmitted by this sediment to the streams and lake.

C. Systems of Best Management Practices:

There are two basic systems of best management practices on cropland being pursued:

Terraces, grassed waterways, grassed field borders, and proper crop rotation.

Contour strip cropping and conservation tillage.

Although terraces, grassed waterways and field borders alone may not bring the soil loss within acceptable tolerance, the reduction is significant.

An example of the importance of good cropping systems is comparison of soil loss from contour strip cropping or conservation tillage with soil loss from clean cultivation. Where farmland is cultivated up and down hill, the soil loss is as high as 24 tons per acre per year. At the beginning of the program, there were cultivated fields with soil loss greater than 24 tons per acre per year. With the same field being conservation tilled, this loss could be brought to 3 tons per acre per year and when contour stripped, the soil loss could be as little as 2 tons per acre per year.

With this type of program, the estimated sediment yields have been reduced 24,000 tons per year or 50 percent.

D. Level and Types of Monitoring:

Water quality monitoring within the Broadway Lake MIP project area has been conducted by both the South Carolina Department of Health and Environmental Control and Clemson University. The Department initially began studying the area to develop baseline information prior to the Corps of Engineers proposed dredging of Broadway Lake. Water quality and biological sampling within the lake and the mouths of Broadway and Neils Creeks was conducted during the period between May 1977 and December 1980. It was the Department's original intent to continue monitoring the lake both during and after completion of the dredging operation. It is now doubtful that the proposed dredging will take place due to the lack of adequate funding to upgrade the Broadway Lake dam. However, the data base developed during this "pre-dredging" monitoring effort will be useful in evaluating water quality changes within the lake resulting from upstream MIP-related activities.

In conjunction with this lake sampling program, the Department also conducted a nonpoint source monitoring effort within the upper Broadway Lake Watershed. During the period between 1978-1979, cropland, pastureland and forested areas within the Brown's and Broadway Creek drainage basins were sampled during dry and wet weather conditions. The objective of this study was to develop a reliable data base for both NPS problem assessment and stream modeling purposes. The results of this nonpoint source monitoring effort can be found in the DHEC publication Assessment of Nonpoint Pollution, Vol. I (February 1980). A subsequent study to determine the efficiencies of selected BMPs never progressed beyond the initial stages due to redirection of the Department's 208 NPS planning effort by the USEPA.

Clemson University, under contract to the USEPA Corvallis Environmental Research Laboratory, has also conducted field research within the MIP project area. The main objective of the Clemson study was to assess changes in the aquatic ecosystem attributable to BMP implementation. Generally, the Clemson study found no significant water quality differences between control and experimental areas after BMPs were applied. Details of the Clemson study can be found in the final report Evaluation of the Broadway Lake MIP Ecosystem Response to NPS Reduction.

E. Impact on Water Quality:

The cumulative impact of BMP implementation upon Broadway Lake will not be known until the Department resamples the lake and its headwaters in late 1983 or early 1984. This delayed sampling effort is to allow the aquatic ecosystem sufficient time to stabilize from the impacts of intensive BMP application throughout the watershed. By comparing pre-dredging to post-MIP sampling data, the Department hopes to identify and evaluate resultant changes in the lake's water quality and biological communities. Assuming that applied BMPs were of sufficient density and proper type to reduce agricultural NPS pollution and roadside erosion, the recreational utility of Broadway Lake should be enhanced and water quality improved.

F. Suggestions On the Need for and Use of Monitoring and Modeling Activities:

There is a definite need for some form of study to be made on special projects with regard to water quality. The study should include such things as sediment yield, aquatic capabilities, and nutrient build-up. This would give information for comparisons.

Monitoring may not be the most practical method of such a study. The requirements of manpower, equipment, and lab work creates an expensive task for information received.

Modeling on the other hand can be a flexible tool in making the same determination on an estimated basis when used with the soil loss equation and other considerations.

V. CONCLUSIONS AND RECOMMENDATIONS

From this program, the following conclusions and recommendations are deemed to be of much value in forthcoming programs of this nature:

A. Careful planning of program prior to initiating date.

B. Careful planning of establishment of priorities.

C. Develop and implement a strong information and education effort at the beginning.

D. Be sure to establish or help establish a local advisory committee or group within the project area.

E. A project coordinator is needed for most projects.

F. Any program involving the need for additional technical assistance should be funded for that purpose.

G. Establish a record and reporting system at the outset; not in the middle or the end.

H. Where monitoring is involved, make previous arrangements for before and after monitoring.

I. Cost-share is an essential part of the program. Cost-sharing should be variable based on estimated benefits of best management practices.